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ABSTRACT

The paper describes a study involving simulation activities in a college level survey course in economics. In addition, it compares student learning in an economics course based on simulation with student learning in a lecture discussion course. The hypothesis was that certain types of students would benefit from the simulation-gaming approach while other students would benefit from a lecture-discussion method. Learning style characteristics considered important for students taught by simulation included receptivity to auditory stimuli, sensibility to peers, and a high degree of self-direction. Conversely, students more receptive to a lecture-discussion method obtain meaning from written words, numerals, and mathematical symbols. On the basis of a cognitive style questionnaire administered to 120 college freshmen at the beginning of the semester, students were designated simulation type or lecture type and were randomly assigned to a simulation or lecture course. All students were provided copies of the same course syllabus and textbook. Scores on three multiple choice, short answer, and essay tests administered throughout the semester were statistically analyzed. Findings indicated that simulation type students performed better in simulation courses than they did in lecture discussion courses. It was concluded that student performance is influenced by interaction between teaching methods and cognitive learning style. (DB)

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SIMULATION ACTIVITIES AND STUDENT LEARNING CHARACTERISTICS IN A COLLEGE ECONOMICS SURVEY COURSE

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ABSTRACT

This study involved the integration of seven simulation activities in a college economics survey course. The thesis of the study was that certain types of students would benefit from this simulation-gaming method of instruction while other students would benefit more from a lecture-discussion method. A cognitive style questionnaire was used to identify the students who would benefit from this particular simulation-gaming method of instruction. An analysis of the study's data revealed that the simulation-gaming method of instruction was superior in improving the course grades of the students who possessed a certain combination of cognitive learning styles. The lecture-discussion method of instruction, however, was superior for the students who lacked that same combination of learning styles.

SIMULATION ACTIVITIES AND STUDENT LEARNING CHARACTERISTICS IN A COLLEGE ECONOMICS SURVEY COURSE

Introduction

In education the concept of individualized instruction has had substantial impact on the way in which the process of education is implemented. Obviously, to individualize instruction the teacher must have some understanding of the individual learning process. The educational science of cognitive learning styles, developed by Joseph Hill and his associates at Oakland Community College, Bloomfield, Michigan, provides a vehicle within which the relationship of the important student learner characteristics, mode of presentation, and instructional setting can be considered [13].

Additionally, the use of simulation games in college economics courses and teacher in-service courses has become more popular during the last 15 years. The results of the research conducted on the use of simulation games to teach college economics, however, have at best been conflicting. Various articles report positive findings while other numerous reports cite inconclusive findings. These conflicting findings may be due to the lack of emphasis placed on identifying the type of student who would benefit from a simulation-gaming method of instruction [2,8].

The authors wish to thank Associate Professor David Staits of the Education Department of Ashland College for assistance with the Cognitive Style Questionnaire.

The purpose of the study examined in this paper was to integrate, implement, and evaluate the use of seven simulation activities in a college-level introductory economics course. The emphasis of the evaluation was placed on determining if the type of student who would benefit from such a method of instruction could be identified based on personal characteristics and learning style.

Course Design

This study involved the implementation of two methods of instruction in an economic survey course. One method of instruction, which was designated the control method, was the lecture-discussion method. The other method of instruction, which was designated the experimental method, was the simulation-gaming method.

The Lecture-Discussion Method. The basic feature of the lecture-discussion method of instruction was the instructor's lectures. However, student questions and comments were encouraged. Thus, discussions of the economic concepts by the instructor and students were a part of the instructional process along with the instructor's lectures. This lecture-discussion method of instruction was designated as the control method because it was the most frequently utilized method of instruction in the Economics Department at Ashland College.

The Simulation-Gaming Method. The students exposed to the simulation-gaming method of instruction were provided copies of the same course syllabus and used the same textbook as did the students who were enrolled in the control classes. However, the simulation-gaming method of instruction involved the integration of simulation activities with the lecture-discussion method of instruction. A total of 18-1/3

class periods were either devoted to playing the simulation activities or spent on the debriefing sessions. Thus, approximately 50% of the 37 class periods used for instruction were devoted to the simulation activities. The seven simulation activities that were used in the simulation gaming technique and the order in which these activities were presented were as follows: (a) Outdoor Endurance [12], (b) Starting a Small Business: A Simulation Game [4], (c) The Multiplier [14], (d) Mr. Banker [10], (e) Tightrope [5], (f) Specialization [3], and Baldicer [15].[1]

Study Implementation

A sample of Ashland College freshman students of the 1978-1979 academic year who declared an intent to major or minor in business administration or economics was selected for use in this study. Since four course sections were made available for this study and each section normally contained 30 students, 120 of the students were randomly sampled. Each of the 120 students was randomly assigned to one of the four course sections used in the study.

The students in two of the course sections were exposed to the simulation-gaming method of instruction. The students in the other two sections were exposed to the lecture-discussion method of instruction. Two instructors were used to teach the four course sections. Each instructor was randomly assigned to a simulation-gaming section and a lecture-discussion section of the introductory economics course.

The introductory course was a one-semester economics course that included both microeconomic and macroeconomic concepts.

Data

The grades received by the students served as the measure of economic knowledge they obtained in the economics course. The students' grades, which served as the dependent variable, were measured on an 11-point scale with F=0 and A=11.

A student's grade was determined by the sum score of three tests, which were administered at approximately five week intervals. Each test contained multiple choice questions, definition and short answer questions, and essay questions. Although each test was based on the objectives of the course and an estimate of the content validity of each test was made by members of the Economics Department, no other type of reliability or validity estimate was made. The readers of this paper are cautioned to keep this limitation in mind.

Since this study dealt with the investigation of the impact of student characteristics and learning styles on the students' economic knowledge, measures of various student attributes were needed. The cognitive learning style data were obtained by administering the Cognitive Style Questionnaire developed by Strother [13]. The complete inventory includes 27 subscores. However, since this experiment was an investigation of the use of simulation activities, only those subscores dealing with learning style characteristics important in the use of this teaching technique were utilized [1]. The seven subscores selected were as follows:

1. Theoretical Auditory Linguistic [T(AL)]: the student obtains meaning from spoken words.
2. Theoretical Auditory Quantitative (T(AQ)]: the student obtains meaning from spoken numerals or mathematical symbols.
3. Theoretical Visual Linguistics (T(VL)]: the student obtains meaning from written words.
4. Theoretical Visual Quantitative (T(VQ)]: the student obtains meaning from written numerals or mathematical symbols.
5. Qualitative Code Empathetic [Q(CEM)]: the student has the ability to place himself in another person's position.
6. Associates (A): the student is influenced by his peers or associates.
7. Individuality (I): the student directs his own behavior and makes his own decisions.

The seven subscores were selected on the basis that certain student traits would prove beneficial for students to possess when taught by the simulation-gaming method. In a similar manner, other traits would be essential for students to possess when taught by the lecture-discussion method. Since the simulation activities used in the experimental classes involved verbal interaction among the participants or the performance of responses to verbal messages, the traits

measured by the subscores T(AL) and T(AQ) were identified as important traits for students to possess when taught by the simulation-gaming method. In addition, the simulation activities required the students to role play, empathize with that role, and interact with their peer-group. Thus, subscores Q(CEM) and A were recorded.

Three traits measured by the Cognitive Style Questionnaire appeared important for the students taught by the lecture-discussion method to possess. More emphasis was placed in the lecture-discussion classes on the use of the textbook and the instructor's notes that were written on the blackboard. Therefore, the subscores T(VL) and T(VQ) were included in the project. The third trait that appeared important for a student to possess when taught by the lecture-discussion method was the student's ability to be self-directed. Therefore, subscore I was recorded for each student.

It was essential for the evaluation of this study that the seven subscores be added together to obtain one score. The resulting sum was used to predict which students would most benefit from each method of instruction. However, the subscores corresponding to the lecture-discussion method--T(VL), T(VQ), and I--had to be transformed before the seven subscores could be added together to obtain a meaningful total score. Since the maximum score for any one section of the Cognitive Style Questionnaire was 40, each of the subscores corresponding to the lecture-discussion method was subtracted from 40. After the transformation of subscores had been completed and the subscales had been added together, the resulting total score could be interpreted.

A student with a high total score should have performed better if taught by the simulation-gaming method. A student with a low total score should have performed better when taught by the lecture-discussion method.

There were six independent variables utilized in this study in addition to the cognitive learning styles variable. Two of these independent variables were the method of instruction and the instructor to whom each student was exposed. The other four independent variables were the student's scholastic abilities, previous economic knowledge, high school economic training, and previous interests in economics.

A student's Scholastic Aptitude Test score (SAT) or American College Test score (ACT), which was converted to a SAT score, was used as the measure of a student's scholastic ability. The hybrid version of the Test of Understanding in College Economics (Hybrid-TUCE) was used as a measure of a student's pre-course economic knowledge (see Saunders [11] for test reliability). A student who had at least nine weeks of high school economic instruction was identified as having had previous training in economics.

With respect to a student's interest in economics, the question whether pre-course or post-course interest should have been used was a valid question. However, since the ultimate purpose of the study was to provided insight into the separation of students into the classes taught by the most appropriate of the two teaching techniques at the beginning of the course, pre-course interest was chosen. The Questionnaire of Student Attitudes Towards Economics (QSATE) was used

to measure the students' pre-course interests towards economics (see Karstensson and Vedder [6] for test reliability and validity).

All the variables utilized in the study are listed in Table 1. In addition, the mean, standard deviation, and t test values for the variables are presented in Table 2.

Insert Table 1 and Table 2 about here

As indicated by the results of the t test presented in Table 2, there was a statistically significant difference at the two-tailed .05 alpha level between the means of the groups with respect to the students' pre-course economic knowledge. There were no statistically significant differences between the means of the experimental and control groups for the other independent variables at the .05 alpha level.

Data Analysis

The thesis of this project was that the simulation-gaming method would be superior to the lecture-discussion method for teaching a college economics survey course for only certain types of students. As previously discussed, variables were selected to test the effectiveness of the simulation-gaming method of instruction. The sum of the seven selected subscores of the Cognitive Style Questionnaire was the variable used to identify which students would perform better when exposed to the simulation-gaming method. The dependent variable was each student's final grade in the economic survey course.

The following hypothesis was constructed to test the effectiveness of the simulation-gaming method of instruction:

$1H_0$: There is no interaction between the methods of instruction and the students' cognitive learning style scores when accounting for the variations in the students' performances in an economic survey class over and above the influence of the methods of instruction and cognitive style scores.

Multiple linear regression models were constructed to test Hypothesis $1H_0$. A regression model, which was identified as the full regression model, was designed to depict the conditions stated in the research hypothesis. In a similar fashion, a regression model, which was identified as the restricted regression model, was designed to reflect the situation depicted in the corresponding null hypothesis. The results of the F test conducted on the R^2 values of the restricted and full regression models were used to test Hypothesis $1H_0$.[2]

The values resulting from the analysis of the data examined by Hypothesis $1H_0$ are presented in Table 3.

Insert Table 3 about here

The interaction effect examined in Hypothesis $1H_0$ accounted for 6.5% of the variation in the students' performance. The 6.5% of explained variation in the students' performances in the economics survey course produced an F value of 7.13, which was significant at the .01 alpha level. Therefore, the interaction between the methods of instruction and the cognitive learning style scores did account for a statistically significant amount of the students' performances in the economics survey course.

A graph of this statistically significant interaction was presented in Figure 1. The graph presented in Figure 1 was obtained by plotting the regression weights of the independent variables of the full regression model used to test Hypothesis $1H_0$. The y-intercept values for the control and experimental groups corresponded to the values for a_0 (12.23) and a_0 plus a_2 (-7.21), respectively. The slopes of the lines for the control and experimental groups corresponded to the values for a_4 (-.045) and a_5 (.084), respectively.

Insert Figure 1 about here

An examination of the graph of the interaction effect presented in Figure 1 indicated that the interaction effect was disordinal. The simultaneous solution of the two regression lines revealed an important result. The students assigned to the experimental classes who had cognitive learning style scores above 151, which was slightly above the average score of 148, generally received higher final grades in the economics survey course than did their counterparts who were assigned to the control classes. However, the students assigned to the control classes who had cognitive learning style scores below 151 points tended to record higher grades in the economics survey course than did their counterparts who were assigned to the experimental classes.

A second hypothesis was also constructed to test the effectiveness of the simulation-gaming method of instruction. The second hypothesis varied from Hypothesis 14, only to the extent that it required the impact of additional student characteristics to be covaried. Hypothesis $2H_0$ was as follows:

$2H_0$: There is no interaction between the methods of instruction and the students' cognitive learning style scores when accounting for the variations in the students' performances in an economics survey course over and above the influences of the methods of instruction, learning style scores, pre-course economic knowledge, scholastic abilities, high school training, teachers, and pre-course interests in economics.

The values resulting from the analysis of the data tested by Hypothesis $2H_0$ are presented in Table 4.

Insert Table 4 about here

The interaction effect examined by Hypothesis $2H_0$ accounted for 4.3% of the variation in the students' performance. This 4.3% of explained variations in student performance produced an F value of 8.41, which was significant at the .01 alpha level. Therefore, the interaction effect between methods of instruction and the cognitive learning style scores did account for a statistically significant amount of the students' performances in the economics survey class even when covarying the other student characteristics.

It should be noted that the percent of variation in the students' course grades explained by the interaction effect investigated in Hypothesis $2H_0$ was somewhat less than the amount explained by the

interaction effect investigated in Hypothesis $1H_0$. However, the interaction effect examined in Hypothesis $2H_0$ produced a higher F value because of the significantly higher amount of variation in the course grades accounted for by the independent variables contained in the full model used to test Hypothesis $2H_0$.

The graph of the interaction effect investigated in Hypothesis $2H_0$ produced similar results to those obtained for Hypothesis $1H_0$. The graph presented in Figure 2 was obtained by plotting the regression weights of the independent variables of the full regression model used to test Hypothesis $2H_0$. However, since this model included independent variables that were covaried, the regression weights for those variables were multiplied by their respective mean values and the resulting product added to the intercept values. Thus, the y-intercept value for the control group corresponded to the value of a_o plus the sum of the products of a_6 through a_{10} multiplied by their respective means, (7.106). The y-intercept values for the experimental group corresponded to a_2 plus a_o plus the sum of the products of a_6 through a_{10} multiplied by their respective means, (-9.097). The slopes of the lines for the control and experimental groups corresponded to the values for a_4 (-.012) and a_5 (+.094), respectively.

Insert Figure 2 about here

An examination of the graph presented in Figure 2 indicated that the interaction effect was disordinal. The simultaneous solution of the two regression lines revealed results that were essentially the

same as the results obtained from the test of Hypothesis $1H_o$. The students assigned to the experimental classes who had cognitive learning style scores of above 153 generally received higher final grades in the economics survey course than did their counterparts who were assigned to the control classes. However, the students assigned to the control classes who had cognitive learning style scores below 153 points tended to record higher grades in the economics survey course than did their counterparts who were assigned to the experimental classes.

Implications

The results of the analysis of Hypotheses $1H_o$ and $2H_o$ supported the thesis of this study. The results indicated that neither the simulation-gaming method of instruction nor the lecture-discussion method of instruction was a superior method for teaching the economics survey course. The simulation-gaming method was the superior method of instruction only for the students that possessed certain cognitive style characteristics. The Cognitive Style Questionnaire appeared to be successful in identifying those characteristics. The results also indicated that this simulation-gaming method of instruction was detrimental to students with other cognitive style characteristics.

Two important implications resulted from this study. First, this simulation-gaming method was successful in improving the performance of certain types of students in a college economics survey course. Since the Cognitive Style Questionnaire requires approximately one hour to administer, the questionnaire appears feasible to use as a means of placing students in the appropriate course sections. In

addition, the direct costs of the simulation activities used were minimal. Therefore, the apparent benefits received by certain students in the form of higher final economics may well outweigh the direct cost of implementing this simulation-gaming method.

Second, in a more general nature, it appears important for teachers and researchers to determine the type of students who benefit from not only the simulation-gaming method of instruction but also other methods of instruction. Obvious questions remain to be answered in this experiment. Was there interaction between the cognitive learning styles and other student characteristics? Or was their joint interaction between methods of instruction, cognitive learning style score and other student characteristics? This analysis is presently being conducted and if enlightening will be reported at a later date. It is naive to think that a given method of instruction will be superior to other methods for all students. Future research projects in economics education should be designed with this point in mind.

Notes

1. A detailed description of the methods of instruction can be found in Chapter III of the doctoral thesis by J. Fraas [2].

2. The F value for each hypothesis was calculated by the following formula:

$$F = \frac{(R_F^2 - R_R^2) \; / \; (m_1 - m_2)}{(1 - R_F^2) \; / \; (N - m_1)}$$

R_F^2 and R_R^2 represented the total variance in the criterion variable that was accounted for by the variation in the predictor variables in the full and restricted regression models, respectively. The symbols m_1 and m_2 represented the number of linearly independent vectors in the full and restricted regression models, respectively. N represented the number of students being examined by the given hypothesis.

References

1. DeNike, L., & Strother, G. Media prescription and utilization as determined by educational cognitive style. Athens, Ohio: Line & Color Publishers, 1976.
2. Fraas, J. The effectiveness of a simulation-gaming method of instruction for teaching college level instructors economics. Unpublished doctoral dissertation, The University of Akron, 1978.
3. Fraas, J. Specialization: A simulation game. Ohio Council for the Social Studies Review, 1978, 14, 10-14.
4. Gupta, S., & Hamman, R. Starting a Small Business. Englewood Cliffs, New Jersey: Prentice-Hall, 1974. (Simulation Game)
5. Hartman, C. Tightrope. El Paso Public Schools, Texas, Board of Education, El Paso Public Schools, 1969. (Simulation Game)
6. Karstensson, L., & Vedder, R. A note on attitude as a factor in learning economics. The Journal of Economic Education, 1974, 5, 109-111.
7. Lewis, D., Wentworth, D., Reinke, R., & Becker, E., Jr. Educational games and simulations in economics. Joint Council on Economic Education, 1974.
8. McCarty, M. Dollars and sense: An introduction to economics. Dallas, Texas: Scott, Foresman & Company, 1976.
9. Miller, J. Student learning preferences, instructor teaching preferences and achievement in economics. Paper presented at the Symposium on Teaching Economics: Two-Year College Faculty,

Virginia Polytechnic Institute and State University, Blacksburg, Virginia, 1978.

10. Nappi, A. Mr. Banker. Minneapolis, Minnesota: Federal Reserve Bank of Minneapolis, 1973. (Simulation Game)

11. Saunders, P., & Welsh, A. The Hybrid-TUCE: Origin, data, and limitations. The Journal of Economic Education, 1975, 7, 13-19.

12. Stanford, G., & Roark, A. Human interaction in education. Boston: Allyn & Bacon, 1974.

13. Strother, S. The way we learn: Educational cognitive style. Athens, Ohio: Ohio University, 1975.

14. Tuckman, B., & Tuckman, H. Toward a more effective economic principles class. The Journal of Economic Education, 1975, Special Issue 3.

15. Wilcoxson, G. Baldicer. Richmond, Virginia: John Knopf Press, 1970. (Simulation Game)

Table 1. Description of Variables

Variables	Description of the Variables
Y_1	Final grades for the economics survey course (F = 0, D- = 1, D = 2, D+ = 3, C- = 4, C = 5, C+ = 6, B- = 7, B = 8, B+ = 9, A- = 10, A = 11)
X_1	Students exposed to the lecture-discussion method of instruction (yes = 1, no = 0)
X_2	Students exposed to the simulation-gaming method of instruction (yes = 1, no = 0)
X_3	The student cognitive learning style scores
X_4	Cognitive learning style scores of the students exposed to the lecture-discussion method of instruction ($X_1 \cdot X_3$)
X_5	Cognitive learning style scores of the students exposed to the simulation-gaming method of instruction ($X_2 \cdot X_3$)
X_6	Pre-course economic knowledge (Pre-course Hybrid-TUCE scores, 0 - 33)
X_7	Scholastic Ability (SAT score, 400 - 1600)
X_8	Students with high school economics instruction (yes = 1, no = 0)
X_9	Teacher A (yes = 1, no = 0)
X_{10}	Pre-course interest in economics (Pre-course QSATE score, 8 - 40)

Table 2. Means, Standard Deviations, and t values for the Experimental and Control Groups

Variable	(n = 52) Control		(n = 53) Experimental		t value
	$\bar{X}$	SD	$\bar{X}$	SD	
Final grade (Y_1)	5.52	2.98	5.09	3.15	---
Cognitive learning style score (X_3)	148.92	11.67	146.42	12.77	1.05
Pre-course knowledge (X_6)	9.37	2.73	10.55	3.19	-2.03[b]
Scholastic ability (X_7)	814.23	168.26	844.34	168.07	1.30
High school economics (X_8)	.327[a]	---	.415[a]	---	1.44
Teacher A (X_9)	.558[a]	---	.472[a]	---	.88
Pre-course interest (X_{10})	29.40	3.47	30.60	3.09	1.87

[a] the proportion of students

[b] statistically significantly different at the .05 alpha level

Table 3. Test Results for Hypothesis $1H_1$

Full Model:	$Y_1 = a_oU + a_2X_2 + a_4X_4 + a_5X_5 + E_1$	
	(12.23) (-19.44) (-.045) (.084)	
Restriction:	$a_4 = a_5$	
Restricted Model:	$Y_1 = a_oU + a_2X_2 + a_3X_3 + E_2$	
	(1.65) (-.36) (.026)	
Full Model $\underline{R}^2$:		.080
Restricted Model $\underline{R}^2$:		.015
df		1/101
F		7.13[a]

Note. The regression coefficients are contained in the parentheses.

[a]Significant at the .01 alpha level.

Table 4. Test Results for Hypothesis $2H_1$

Full Model:	$Y_1 = a_0U + a_2X_2 + a_4X_4 + a_5X_5 +$
	$(.235) \quad (-16.203) \quad (-.012) \quad (+.094)$
	$a_6X_6 + a_7X_7 + a_8X_8 + a_9X_9 +$
	$(+.059) \quad (+.011) \quad (-.384) \quad (+.470)$
	$a_{10}X_{10} + E_3$
	$(-.098)$
Restriction:	$a_4 = a_5$
Restricted Model:	$Y_1 = a_0U + a_2X_2 + a_3X_3 + a_6X_6 +$
	$(-9.669) \quad (-.553) \quad (+.048) \quad (+.059)$
	$a_7X_7 + a_8X_8 + a_9X_9 + a_{10}X_{10} + E_4$
	$(+.012) \quad (-.310) \quad (+.608) \quad (-.078)$
Full Model $\underline{R}^2$:	.509
Restricted Model $\underline{R}^2$:	.466
df	1/96
F	8.41[a]

[a]Significant at the .01 alpha level.

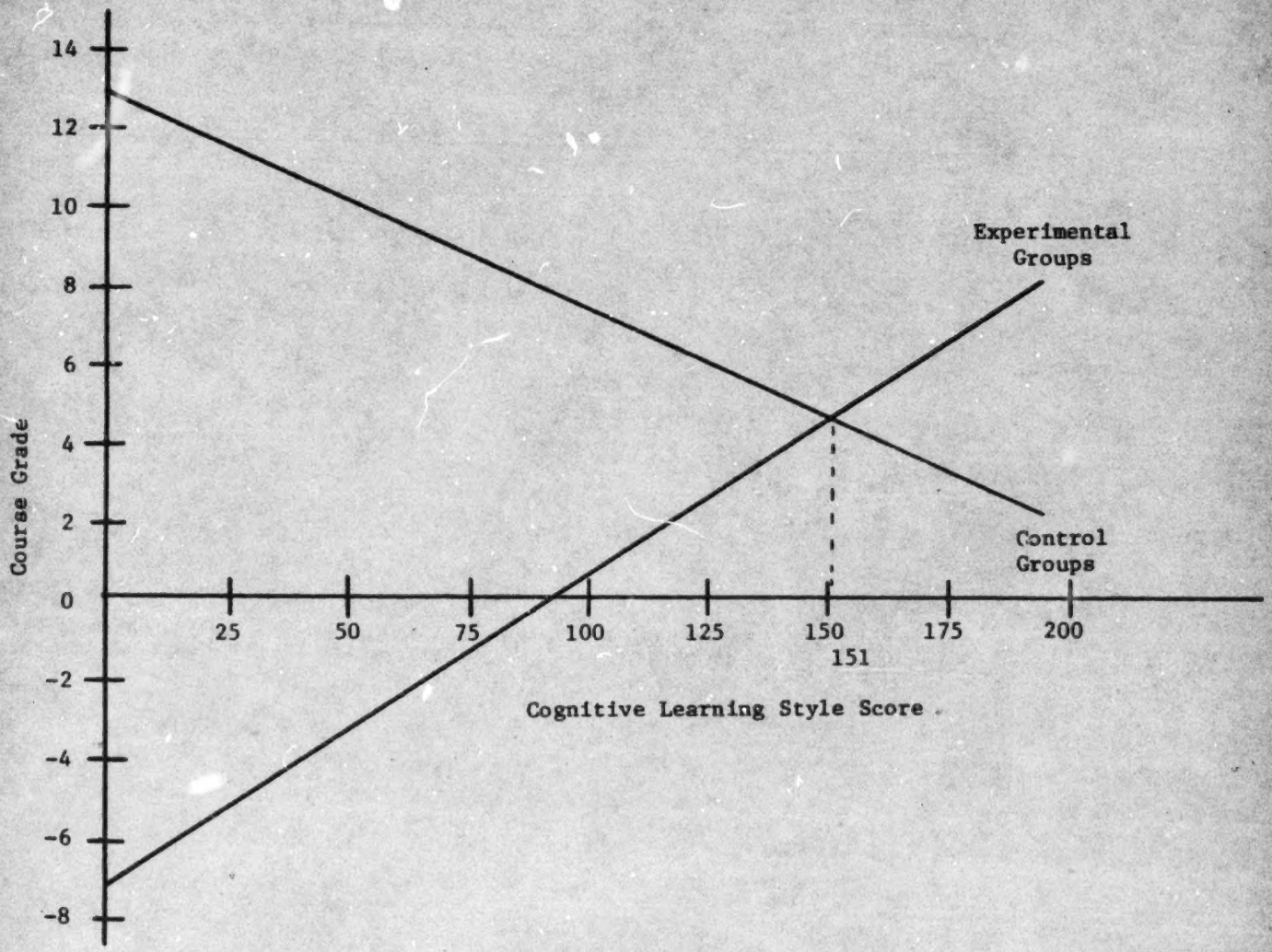

Figure 1. Interaction Between the Methods of Instruction and the Cognitive Learning Style Scores

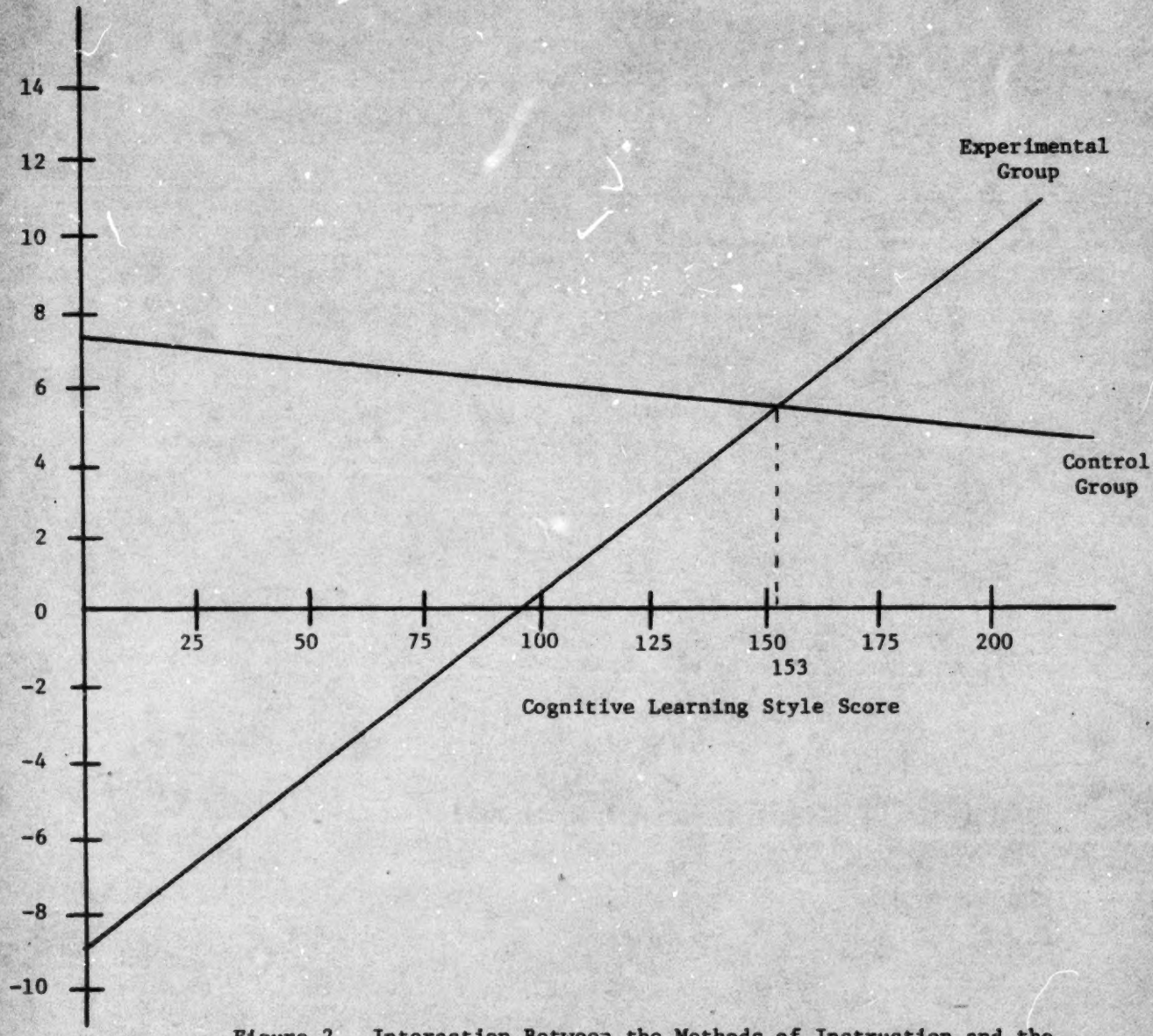

Figure 2. Interaction Between the Methods of Instruction and the Cognitive Learning Style Scores, with Other Characteristics Covaried